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**TITLE:** Use of a Portable Stimulator to Treat GWI

**PRINCIPAL INVESTIGATOR:** Jorge M. Serrador, PhD

**CONTRACTING ORGANIZATION:** Veterans Biomedical Research Institute  
East Orange, NJ 07018

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Fort Detrick, Maryland 21702-5012

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14. ABSTRACT The purpose of this research is to characterize vestibular function in a population of veterans with Gulf War Illness and determine if subsensory electrical stimulation can improve vestibular function. To date, we have collected vestibular screening data on nine subjects, with four scheduled to return for visits using electrical stimulation. Since we have preliminary data only and have not completed subject visits using electrical stimulation, we are unable to report any significant finding during this research period.					
15. SUBJECT TERMS Nothing listed					
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## 1. INTRODUCTION

Gulf War Veterans have a significantly greater incidence of reporting dizziness, suggesting vestibular involvement. Gulf War Veterans with Gulf War Illness (GWI) demonstrate impaired balance, specifically during conditions which rely on vestibular inputs, suggesting vestibular impairment in ~50% of this population. In this study, we will determine the level of vestibular dysfunction within Veterans with GWI and apply the novel method of stochastic noise, shown to improve neural signals, to enhance vestibular function and balance in those with vestibular impairments. To treat Veterans diagnosed with GWI that have vestibular (balance) dysfunction we will use a portable stochastic noise electrical stimulator that provides low levels of stimulation which is imperceptible to enhance vestibular and balance function.

## 2. KEYWORDS

Vestibular, Gulf War Illness

## 3. ACCOMPLISHMENTS

### MAJOR GOALS OF THE PROJECT

Major Goal 1 – Characterize vestibular dysfunction in Veterans with Gulf War Illness

#### Subtask 1: Establish Project Management System/Develop Logistical Plan (Sept- Dec 2014)

- a. Train the current members of the team (research assistant) on vestibular screenings, balance assessments, galvanic stimulation (**completed**)

**Milestone #1:** Establish project management system, hire and train research staff (Planned Completion Dec 2014) – **100% complete**

#### Subtask 2: Regulatory Review and Approval Process (Sept - Dec 2014)

- a. Finalize IRB paperwork including application, protocol and consent form (**completed**)
- b. Submit any revisions requested by the regulatory board prior to approval (**completed**)
- c. Obtain DoD HRPO approval (**completed**)

**Milestone #2:** Regulatory review and approval obtained (Planned completion Dec 2014) – **100% complete**

#### Subtask 3: Recruitment Plan (Sept 2014 – June 2015)

- a. Develop plan to meet recruitment goals (**completed**)
- b. Mail IRB approved recruitment letters to Veterans seen at the WRIISC; follow up with phone calls
  - ~150 Gulf War Veterans evaluated at the WRIISC– 25 letters per week will be mailed to this subset followed by a phone call  
(**155 veterans have been phoned as part of recruitment**)

- c. Distribute flyers to all VA facilities and their ambulatory services including community-based outpatient clinics to publicize the study
- d. Contact Veteran Service Organizations for support on best way to perform outreach **(having monthly meetings with VSO representatives that are Gulf War Veterans to discuss recruitment goals) (plans made for Gulf War Outreach event)**

**Milestone #3: Recruitment Plan Executed (Planned Completion June 2015) -60% complete**

Subtask 4: Determine the prevalence of vestibular impairment in GWI veterans (Aim 1) & Determine the effectiveness of subsensory electrical stimulation in a population of Veterans with vestibular dysfunction to improve balance function (Aim 2) (Dec 2014- June 2016)

- a. Screen subjects/ collect data: total of 140 subjects
  - 3 subjects per week/ 3 study visits
  - Vestibular testing, balance assessments

**(11 subjects have been enrolled; 1 was excluded; 9 completed testing for Aim 1; 8 subjects have had their data analyzed and 4 subjects will be returning for subsensory electrical stimulation in Aim 2)**
- b. Data analysis (Post-doctoral fellow/research assistant will continually analyze data as collected) **(9 subjects have been assessed for vestibular impairments)**
- c. Present/publish work

**Milestone #4: Enrolled and tested subjects (Planned Completion March 2016) – 6% Completion**

**Milestone #5: Data analysis completed (Planned Completion April 2016) – 6% Completion**

**Milestone #6: Data presented/published (Planned Completion June 2016) – 0% Completion**

## **ACCOMPLISHMENTS DURING THIS ANNUAL PERIOD**

### **Major Activities**

- Obtained VANJ IRB and HRPO approval.

**Milestone #2: Regulatory review and approval obtained (Planned completion Dec 2014) -100% complete**

- Enrollment of study subjects
- Data collection and analysis of enrolled subjects performed

**Milestone #4: Enrolled and tested subjects (Planned Completion March 2016) – 6% Complete**

### **Specific Objectives for Year 1**

- 1) Hire research engineer and research assistant
- 2) Train staff on vestibular screenings, balance assessments, and electrical stimulation
- 3) Research engineer will optimize equipment and develop improved analysis scripts for laboratory based stimulator
- 4) Obtain IRB approval at the VA NJ
- 5) Obtain DoD HRPO approval to allow initiation of research
- 6) Develop plan to meet recruitment goals and execute plan for recruitment
- 7) Initiation of subject recruitment for data collection and analysis
- 8) Analyze collected data

### **Significant Results of Year 1**

- 1) Research engineer and research assistant were hired
- 2) Staff was trained on vestibular screenings, balance assessments, and electrical stimulation
- 3) Research engineer developed new scripts to improve analysis for laboratory based stimulator
- 4) Approval by VA IRB was obtained on November 3, 2014
- 5) Approval by HRPO of VA NJ IRB documents on Feb 6, 2015
- 6) A recruitment plan was developed to meet monthly and weekly recruitment goals and is being executed
- 7) Subject recruitment has begun and data collection continues
- 8) Data is being analyzed to determine eligibility for electrical stimulation visits

### **Major Findings, Developments, Conclusions, and Other Achievements**

- Nothing to Report

### **What opportunities for training and professional development has the project provided?**

This project has provided training for all research staff to be competent at vestibular screenings, balance assessments, and electronic stimulation procedures. The post-doctoral fellow has been able to travel to Dr. Schubert's clinic at Johns Hopkins to be trained on most up to date vestibular testing techniques.

### **How were the results disseminated to communities of interest?**

- Nothing to Report

### **What do you plan to do during the next reporting period to accomplish the goals?**

- 1) Continued execution of recruitment plan to screen subjects for enrollment
- 2) Data collection and analysis from enrolled subjects
- 3) Re-visit recruitment plans to further develop outreach events at VA NJ

#### **4. IMPACT**

**What was the impact on the development of the principal discipline(s) of the project?**

- Nothing to Report

**What was the impact on other disciplines?**

- Nothing to Report

**What was the impact on technology transfer?**

- Nothing to Report

**What was the impact on society beyond science and technology?**

- Nothing to Report

#### **5. CHANGES/PROBLEMS**

- Nothing to Report

**Changes in approach and reasons for change**

- Nothing to Report

**Actual or anticipated problems or delays and actions or plans to resolve them**

- **While** recruitment has been slower than expected, we have recruited 11 Veterans with GWI and we have 8 more that are eligible and are being scheduled. To ensure we meet our recruitment goals we have increased our recruitment efforts. While not in the period of this annual report, in October we provided information to several veteran service organizations (Veterans of Foreign Wars, American Legion, Disabled American Veterans, National Gulf War Resource Center) about the research to recruit Veterans both locally and nationally.

- In addition if we look at the pattern so far, 4 of 8 Veterans qualified as having low vestibular function and could participate in the treatment trial. If this trend continues we will only need to recruit 84 Veterans to obtain 42 with vestibular hypofunction. We currently have 19 eligible Veterans which is 22% of 84. Based on these findings and my previous experience that through word of mouth, as we recruit more Veterans with GWI, more will contact us, I am confident we will be able to recruit another 65 Veterans in the next 6-9 months.

#### **Changes that had a significant impact on expenditures**

- There were no changes in expenditures.

#### **Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents:**

##### **Significant changes in use or care of human subjects**

- No changes to use of care of human subjects to report
- Approval by VA IRB was obtained on November 3, 2014
- Approval by HRPO of VA NJ IRB documents on Feb 6, 2015

##### **Significant changes in use or care of vertebrate animals.**

- No animal use research will be performed to complete the Statement of Work

##### **Significant changes in use of biohazards and/or select agents**

- No biohazards and/or select agents will be used to complete the Statement of Work

## **6. PRODUCTS**

#### **Publications, conference papers, and presentations**

- Nothing to Report

#### **Journal publications.**

- Nothing to Report

#### **Books or other non-periodical, one-time publications**



- Nothing to Report

**Other publications, conference papers, and presentations.**

- Nothing to Report

**Website(s) or other Internet site(s)**

- Nothing to Report

**Technologies or techniques**

- Nothing to Report

**Inventions, patent applications, and/or licenses**

- Nothing to Report

**Other Products**

- Nothing to Report

**7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS**

**What individuals have worked on the project?**

Name: Jorge Serrador, PhD

Project Role: PI

Nearest person month worked: 2.5

Contribution to Project: no change

Name: Apollonia Fox, PhD

Project Role: Postdoctoral Fellow

Nearest person month worked: 1.5

Contribution to project: no change

Name: Bishoy Samy, MS

Project Role: Research Engineer

Nearest person month worked: 1

Contribution to Project: no change

Name: Tien Le, BEng

Project Role: Research Assistant

Nearest person month worked: 3

Contribution to Project: no change

**Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?**

- Nothing to Report

**What other organizations were involved as partners?**

1. Organization Name: University of Western Sydney- Paul Breen, PhD

Location of Organization: Australia

Partner's contribution to the project:

- Financial support – Nothing to report
- In-kind support – Dr. Breen's salary is covered by UWS as detailed in original proposal.
- Facilities – Nothing to report
- Collaboration – Designed a novel low power stochastic noise stimulator that will be used to improve vestibular function in our patients
- Personnel exchanges – Nothing to report
- Other – Nothing to report

2. Organization Name: Azusa Pacific University- Scott Wood, PhD

Location of Organization: California

Partner's contribution to the project:

- Financial support – Nothing to report
- In-kind support – Nothing to report
- Facilities – Nothing to report
- Collaboration – Provided expertise in scientific protocol development & vestibular assessment
- Personnel exchanges – Nothing to report
- Other – Nothing to report

2. Organization Name: Johns Hopkins University – Michael Schubert, PhD

Location of Organization: Maryland

Partner's contribution to the project:

- Financial support – Nothing to report
- In-kind support – Nothing to report
- Facilities – Nothing to report
- Collaboration – Provided expertise in scientific protocol development & vestibular assessment

- Personnel exchanges – Nothing to report
- Other – Nothing to report

## **8. SPECIAL REPORTING REQUIREMENTS**

- None

**QUAD CHARTS:** If applicable, the Quad Chart (available on <https://www.usamraa.army.mil>) should be updated and submitted with attachments.

## **9. APPENDICES:** None.

# Use of a Portable Stimulator to Treat Gulf War Illness

## Innovative Treatment Evaluation Award

Funding Opportunity Number: W81XWH-14-1-0598



PI: Jorge M. Serrador, PhD

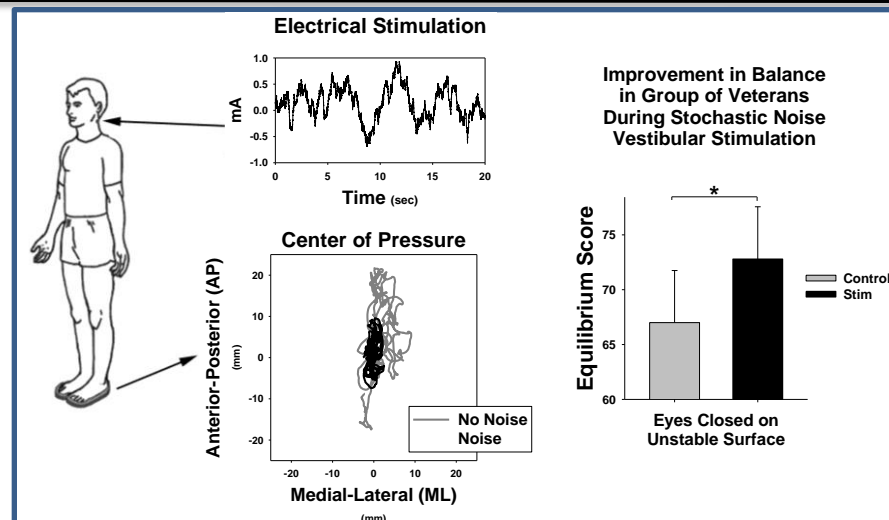
Org: Veterans Biomedical Research Institute Award Amount: \$553,095

### Problem and Military Relevance

- Gulf War Veterans have a significantly greater incidence of reporting dizziness, suggesting vestibular involvement
- Gulf War Veterans with GWI demonstrate impaired balance, specifically during conditions which rely on vestibular inputs, suggesting vestibular impairment in ~50% of our sample
- We will determine the level of vestibular dysfunction and apply the novel method of stochastic noise, shown to improve neural signals, to enhance vestibular function and balance in those with vestibular impairments

### Proposed Solution

To treat Veterans diagnosed with GWI that have vestibular (balance) dysfunction we will use a portable stochastic noise electrical stimulator that provides low levels of stimulation which is imperceptible to enhance vestibular and balance function



**Left Panel:** Sway data from a veteran during postural testing with eyes closed. Notice the significant reduction in both AP and ML sway with imperceptible stochastic noise electrical stimulation applied through skin electrodes just behind the ears.

**Right Panel:** Improvement in equilibrium in veterans during stochastic noise electrical stim.

### Timeline and Total Cost

Activities	CY	14	15	16
Obtain Regulatory Review and Approval				
Execute recruitment plan to meet goals				
Vestibular screenings of GWI Veterans				
Sub-sensory galvanic stimulation testing				
Data Analysis				
<b>Estimated Budget (\$K)</b>		<b>\$68.4</b>	<b>\$275</b>	<b>\$209.6</b>

Updated: October 21, 2015

### Goals/Milestones

#### CY14 Goal – Project Planning and Approval

- ☒ Establish Project Management System/Develop Logistical Plan
- ☒ Obtain Regulatory Review and Approval

#### CY14/15 Goals – Execute recruitment plan

- ☒ Develop and execute plan to meet recruitment goals

#### CY15/16 Goals – Recruit Subjects & Perform Galvanic Stimulation

- ☐ Screen 140 subjects using vestibular and balance testing to characterize the vestibular impairments of Veteran with GWI
- ☐ Use of stochastic electrical stimulation in 42 GWI Veterans with vestibular impairments
- ☐ Analyze collected data and evaluate effectiveness of sub-sensory galvanic stimulation